Metallic nanoparticles are manufactured in increasing volume as catalysts, conductive inks, and antimicrobial agents in consumer and medical products, and are a high priority case for near-term environmental and human health risk assessment. For nanoscale silver and copper, risk assessment is complicated by their near-noble chemistry, which allows them to be fabricated and sold in zero-valent form, but also allows them to undergo environmental oxidation during storage, use and disposal. This oxidation may be accompanied by release of soluble ions that are the primary toxicants of concern, or may allow formation of solid sulfide and selenide phases, which represent low-solubility, low-bioavailability end states for silver and copper in the environment and human tissue. Silver chemistry is further complicated by photoreduction processes that convert once-oxidized silver complexes to secondary zero-valent silver nanoparticles in the presence of sunlight in surface waters or skin. This talk explores the current state of knowledge of the chemical transformations of nanosilver and nanocopper in environmental and biological systems. Understanding these transformations will be shown to be key to understanding silver and copper toxicity mechanisms, environmental fate and transport, natural detoxification processes, and the pathways leading to argyria (skin discoloration) following chronic oral exposure.

Robert Hurt is a Professor of Engineering at Brown University in Providence, Rhode Island and Director of Brown’s materials and nanosciences institute, IMNI. He received a B.S. from Michigan Technological University and a Ph.D. from the Massachusetts Institute of Technology, both in chemical engineering. Before coming to Brown in 1994, he held posts at Bayer AG in Leverkusen, Germany and Sandia National Laboratories in Livermore, California. He served 2004-2010 as Editor of the scientific journal Carbon and became Editor-in-Chief in January, 2013. He has been Technical Program Chair for the International Carbon Conference and Graffin Lecturer of the American Carbon Society. He received the Silver Medal of the Combustion Institute, the Tau Beta Pi teaching award at Brown and in 2013 the Charles E. Pettinos Award of the American Carbon Society. His current research focuses on the behavior of inorganic nanomaterials in living systems and the natural environment, safe material design, carbon materials, and new 3D material architectures from graphene assembly.

Friday, November 1, 2013
2:00PM – 3:00pm
Tech LR3